Status of the Claims

Claims 1-20 remain pending in the present application, Claim 11 having been amended to correct a minor typographical error, and Claim 20 having been amended to correct a typographical error so that it properly refers to the claim from which it depends. None of the claims have been substantively amended.

Claim Objections

The Examiner has objected to Claim 20 for failing to identify the claim upon which it depends. Applicants have amended the claim to recite that it depends from independent Claim 11 and respectfully request the Examiner withdraw his objection to this claim.

Claims Rejected under 35 U.S.C. § 103(a)

The Examiner has rejected Claims 1-2, 4, 6, 10-12, 14, 16, and 20 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,570,430 (Sheehan et al., hereinafter "Sheehan '430") and U.S. Patent No. 5,889,524 (Sheehan et al., hereinafter "Sheehan '524"), in view of U.S. Patent 4,852,139 (Sandrik et al., hereinafter "Sandrik"). Applicants respectfully disagree with this rejection for at least the following reasons.

In the interest of reducing the complexity of the issues for the Examiner to consider in this response, the following discussion focuses on independent Claims 1 and 11. The patentability of each remaining dependent claim is not necessarily separately addressed in detail. However, applicants' decision not to discuss the differences between the cited art and each dependent claim should not be considered as an admission that applicants concur with the Examiner's conclusion that these dependent claims are not patentable over the disclosure in the cited references. Similarly, applicants' decision not to discuss differences between the prior art and every claim element, or every comment made by the Examiner, should not be considered as an admission that applicants concur with the Examiner's interpretation and assertions regarding those claims. Indeed, applicants believe that all of the dependent claims patentably distinguish over the references cited. Moreover, a specific traverse of the rejection of each dependent claim is not required, since dependent claims are patentable for at least the same reasons as the independent claims from which the dependent claims ultimately depend.

<u>Patentability of Independent Claim 1</u>

Significant differences exist between the recited subject matter and the prior art because the prior art does not teach or suggest the step of calculation of a pre-determined set of feature images as recited in step (c). A portion of applicants' step (c) recites (with emphasis added):

> calculating a pre-determined set of feature images *from the sequence of image frames, the ED and ES image frames, and the anatomic landmarks,*

Notice that the source of applicants' pre-determined set of feature images is recited in the claim. This source includes end diastole and end systole image frames and anatomic landmarks. For example, block 12 of applicants' FIGURE 1 is labeled raw data and it includes:

> (a) user-specified end ED and ES image frames; (b) a subset of the image frames for the ventriculogram, during which the heart has completed several heart beats, determined from the user-chosen ED and ES frames; and (c) user-specified locations for a small number of anatomic landmarks in the chosen ED and ES frames. (Specification, page 8, lines 17-20.)

Thus, it will be apparent that the pre-determined set of feature images is based on raw data for the current patient. In contrast, it appears that Sheehan '524's control meshes are NOT generated from raw data for a patient. The Examiner asserts that Sheehan '524 includes a step related to producing a set of feature images (i.e., the subdivided control meshes) and cites column 7, lines 42-56 of Sheehan in support of his assertion (Office Action, page 3). This citation is reproduced below:

> Based on a knowledge of cardiac structure, and on the requirements for analyzing parameters of cardiac status and function, an abstract model is generated in a block 16. The abstract model includes abstract faces, edges, and/or vertices labeled according to their location relative to the anatomic landmarks. X, y, and z coordinates are manually assigned to the vertices of the abstract model in a block 18, to produce an initial embedded control mesh. In the preferred embodiment, the data for *a plurality of hearts are averaged* to produce the x, y, and z coordinates for the vertices of the abstract model. The initial embedded control mesh is subdivided N times in a block 20. In the preferred embodiment, the value of N is equal to 2. This step produces *an embedded subdivided mesh,* which is then applied to the data for an individual's heart. (Emphasis added, Sheehan '524, column 7, lines 42-56.)

From this disclosure, it appears that Sheehan 524's embedded subdivided mesh is produced from knowledge of cardiac structure and from an abstract model produced by averaging data for a plurality of hearts, so that this mesh data is not derived from the patient being examined at hand, and

-7-

1054-3740-4600PT
UNIV0170-1-21\0170AM03-28-2007.doc

LAW OFFICES OF RONALD M. ANDERSON
600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816   Fax: (425) 646-6314

is clearly not raw data for that patient. From FIGURE 1 in Sheehan '524, it appears that data being taken from the patient being examined at hand are indicated in blocks 12 and 14, which describe imaging the heart and manually tracing borders and anatomic landmarks for the resulting images. In contrast, in a separate branch of FIGURE 1, the steps that produce the subdivided initial embedded control mesh are indicated in block 16, block 18, and block 20. There is no teaching or suggestion that the embedded subdivided mesh is a product of the sequence of image frames, the ED and ES image frames, AND anatomic landmarks. In other words, it is clear that the embedded subdivided mesh is NOT created from raw data taken from the current patient.

Further, there is no motivation to modify or combine the teaching of Sheehan '524 with that of Sheehan '430. The Examiner asserts that although Sheehan'430 does not teach or suggest the calculation of a pre-determined set of feature images, that it would have been obvious to one of ordinary skill in the art at the time of the invention to include the control mesh (feature image) calculating step, as taught by Sheehan '524, in the left ventricle contour determination method of Sheehan'430, in order to generate a three-dimensional representation of the heart as disclosed by Sheehan'524, at column 5, lines 25-33. Thus, the Examiner asserts that the motive for combination of the references would be *to generate a **three-dimensional representation of the heart***. However, as recited in the preamble of Claim 1, the method is directed towards automatically determining **a contour** of a left ventricle of a heart. Also, step (f) "fitting a smooth curve to the boundary pixels extracted from the classifier output for both the ED and ES image frames, to indicate the ***contour*** of the left ventricle for ED and ES portions of the cardiac cycle." (Emphasis added.) The production of a ***two-dimensional*** contour is not the same as production of a three-dimensional representation of the heart. Thus, applicants submit that no motivation exists to combine Sheehan '524 with Sheehan '430, and even if the combination were logically motivated, the result would be to produce a three-dimensional representation of the heart and NOT the two-dimensional contour, as recited by applicants in this claim.

For the reasons noted above, the rejection of Claim 1 over Sheehan '430, and Sheehan '524, in view of Sandrik should be withdrawn, since the claim is patentable over these references. Similarly, since dependent claims inherently include what is recited in the independent claim on which they ultimately depend, Claims 2, 4, 6, and 10 are patentable over Sheehan '430, and Sheehan '524, in view of Sandrik, for the same reasons as set forth above in connection with Claim 1.

Patentability of Independent Claim 11

Independent Claim 11 is directed towards a system for automatically determining a contour of a left ventricle of a heart, based upon digital image data from a contrast-enhanced left ventriculogram. The Examiner has rejected Claim 11 for reasons similar to those given in conjunction with the rejection of Claim 1. The recitation of subparagraph (c)(iii) in Claim 11 is generally similar to step (c) of Claim 1. Likewise, the recitation of subparagraph (c)(vi) in Claim 11 is generally similar to that of subparagraph (f) in Claim 1. Thus, for the reasons set forth in applicants' traversal of the rejection of Claim 1, applicants submit that significant, non-obvious, and patentably distinct differences exist between the recited subject matter and the prior art, because the prior art does not teach or suggest calculation of a pre-determined set of feature images as recited in subparagraph (c)(iii), and even if combined, would fail to teach what is recited in Claim 11.

For the reasons noted above, the rejection of Claim 11 over Sheehan '430, and Sheehan '524, in view of Sandrik should be withdrawn, since the claim is patentable over these references. Also, since dependent claims inherently include what is recited in the independent claim on which they depend, Claims 12, 14, 16, and 20 are patentable over Sheehan '430, and Sheehan '524, in view of Sandrik for the same reasons as set forth above in connection with Claim 11.

Patentability of Dependent Claims

The Examiner has rejected Claims 3 and 13 under 35 U.S.C. § 103(a) as being unpatentable over Sheehan '430 and Sheehan '524, in view of Sandrik as applied above, and further in view of the article "Hyperspectral Techniques in Analysis of Oral Dosage Forms."

The Examiner has also rejected Claims 5 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Sheehan '430 and Sheehan '524, in view of Sandrik as applied above, and further in view of U.S. Patent Publication No. 2003/0095696 (Reeves et al.).

The Examiner has further rejected Claims 7-8 and 17-18 under 35 U.S.C. § 103(a) as being unpatentable over Sheehan '430 and Sheehan '524, in view of Sandrik as applied above, and further in view of U.S. Patent No. 6,456,993 (Freund) and the article entitled: "Experiments with a New Boosting Algorithm."

Additionally, the Examiner has rejected Claims 9 and 19 under 35 U.S.C. § 103(a) as being unpatentable over Sheehan '430 and Sheehan '524, in view of Sandrik as applied above, and further in view of U.S. Patent No. 6,993,170 (Johnson et al.).

However, the above claims all ultimately depend from independent Claims 1 and 11. Since dependent claims inherently include what is recited in the independent claim on which they depend, Claims 3, 5, 7-8, 9, 13, 15, 17-18, and 19 are patentable over the various combined cited art for the same reasons as set forth above in connection with applicants' traverse of the rejection of Claims 1 and 11.

In view of the Remarks set forth above, it will be apparent that the claims in this application define a novel and non-obvious invention. The application is in condition for allowance and should be passed to issue without further delay. Should any further questions remain, the Examiner is invited to telephone applicants' attorney at the number listed below.

Respectfully submitted,

/sabrina k. macintyre/
Sabrina K. MacIntyre
Registration No. 56,912

SKM/RMA:elm

1054-3740-4600PT
UNIV0170-1-21\0170AM03-28-2007.doc